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# *Information Bulletin*

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*Grade 9 Science*  
*1995-96*



This document was written primarily for:

|                  |                   |
|------------------|-------------------|
| Students         | ✓                 |
| Teachers         | ✓                 |
| Administrators   | ✓                 |
| Parents          |                   |
| General Audience |                   |
| Others (Specify) | ✓ Superintendents |

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This bulletin contains general information about the Provincial Student Assessment Program and information specific to the Grade 9 Science Achievement Test. **It replaces all previous bulletins.**

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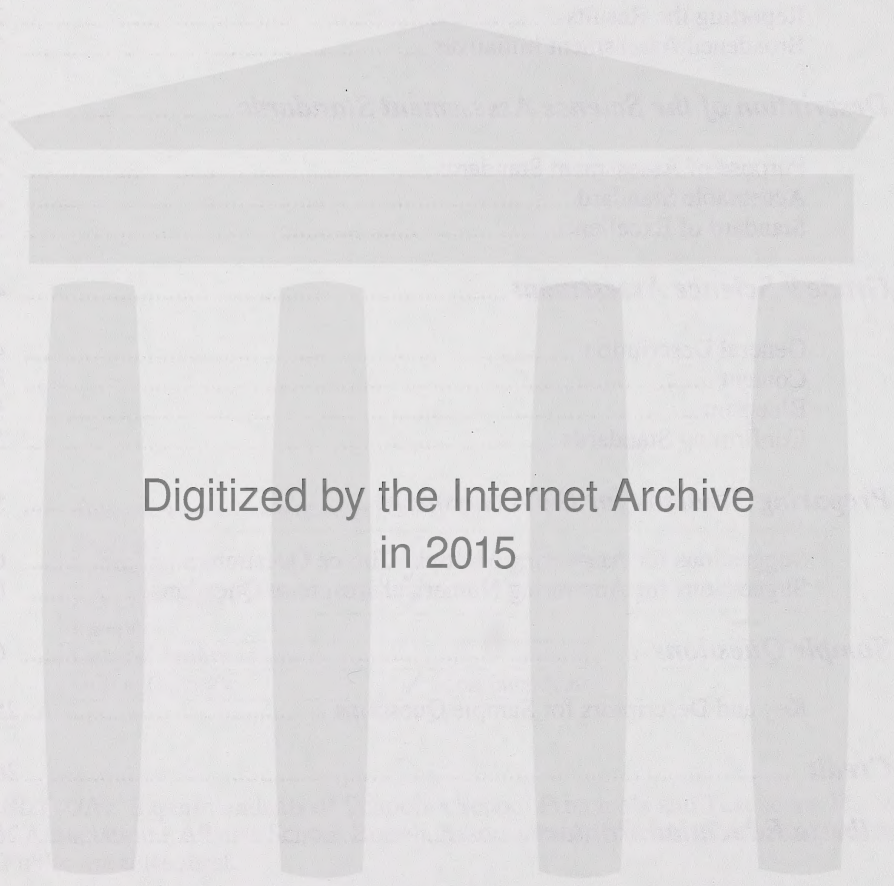
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**October 1995**

# Contents

|  |           |
|--|-----------|
| <b>General Information .....</b>                             | <b>1</b>  |
| Administering the Assessment .....                           | 1         |
| Schedule .....   | 1         |
| Students in French Immersion Programs .....                  | 1         |
| Marking Achievement Tests Locally .....                      | 2         |
| Reporting the Results .....                                  | 2         |
| Broadened Assessment Initiatives .....                       | 2         |
| <b>Description of the Science Assessment Standards .....</b> | <b>2</b>  |
| Purpose of Assessment Standards .....                        | 2         |
| Acceptable Standard .....                                    | 2         |
| Standard of Excellence .....                                 | 3         |
| <b>Grade 9 Science Assessment .....</b>                      | <b>4</b>  |
| General Description .....                                    | 4         |
| Content .....  | 4         |
| Blueprint .....  | 5         |
| Confirming Standards .....                                   | 5         |
| <b>Preparing Students for the Assessment .....</b>           | <b>5</b>  |
| Suggestions for Answering Multiple-Choice Questions .....    | 6         |
| Suggestions for Answering Numerical-Response Questions ..... | 6         |
| <b>Sample Questions .....</b>                                | <b>6</b>  |
| Key and Descriptors for Sample Questions .....               | 25        |
| <b>Credit .....</b>  | <b>26</b> |
| <b>Alberta Education Contact .....</b>                       | <b>26</b> |





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## General Information

The Provincial Student Assessment Program provides teachers, parents, students, school administrators, Alberta Education, and the public with information about what students know and can do in relation to provincial standards. Group results are reported at school, district, and provincial levels to improve learning opportunities for students.

The assessments are administered in two subject areas at Grade 3—language arts and mathematics—and in four subject areas at grades 6 and 9—language arts, mathematics, social studies, and science.

The assessments are based on provincial standards, which reflect important learnings in the subject areas listed above. Classroom teachers from across the province are extensively involved in developing and field testing the assessment instruments.

### Administering the Assessment

Information about the nature of the provincial assessments as well as their administration to special-needs students can be found in the *General Information Bulletin, Achievement Testing Program*, which is mailed to all superintendents and principals in the fall each year.

### Schedule

The written-response component of English and French Language Arts will be administered during the last week of May. The machine-scorable component of all achievement tests will be administered during the last two weeks of June. Specific information regarding scheduling is provided in the current *General Information Bulletin, Achievement Testing Program*.

To minimize any risks to security, we recommend that all students complete the

test on the same day. Superintendents approve a local schedule for achievement test administration within the dates provided. Students who are absent when the tests are administered and who return to school by the end of the school year must write the tests upon their return. By scheduling the tests early in the administration period most, if not all, absentees can be tested upon their return to school. The principal is responsible for ensuring the security of the tests.

The tests that will be administered each year are:

#### Grade 3

English Language Arts (*Part A: Writing and Part B: Reading*)

Mathematics (English and French forms)

#### Grade 6

English Language Arts (*Part A: Writing and Part B: Reading*)

Français 6<sup>e</sup> Année (*Partie A: Production écrite and Partie B: Lecture*)

Mathematics (English and French forms)

Science (English and French forms)

Social Studies (English and French forms)

#### Grade 9

English Language Arts (*Part A: Writing and Part B: Reading*)

Français 9<sup>e</sup> Année (*Partie A: Production écrite and Partie B: Lecture*)

Mathematics (English and French forms)

Science (English and French forms)

Social Studies (English and French forms)

### Students in French Immersion Programs

All students in French Immersion programs must write the French form of the achievement tests. Alberta Education will send a checklist to schools by January requesting an indication of how many English or French tests are required. These forms must be returned through jurisdiction offices by mid-February.



## ***Marking Achievement Tests Locally***

Teachers will be able to mark the tests before returning them to Alberta Education. Teachers can use the results as part of an individual student's year-end assessment, as well as for planning instruction.

## ***Reporting the Results***

Each school jurisdiction will receive a district report and school reports for their students' achievement, as well as guidelines for interpreting these results in relation to provincial standards.

To facilitate reflection on school programs, we expect that results will be shared with all school staffs (not just teachers of grades 3, 6, and 9), as well as with parents and the community.

Individual student profiles will be sent to the school that the student will attend in September. We also expect that these reports will be shared with parents.

Provincial results for each subject and grade will be made public in September in documents titled *Assessment Highlights*.

## ***Broadened Assessment Initiatives***

The Student Evaluation Branch has developed additional instruments to collect a broader base of information about what students know and can do than achievement tests themselves can provide. These instruments will be administered to a provincial sample of students in all subjects on a rotating basis. The following assessments will be given in 1996:

### **Grade 3**

- problem-solving activities in mathematics

### **Grade 6**

- "whole book" performance-based assessment in language arts

### **Grade 9**

- problem-solving activities in mathematics

## ***Description of the Science Assessment Standards***

The provincial standards are the basis upon which we assess how well students have learned science by the end of Grade 9.

These standards reflect the essential learnings that all Alberta students are expected to achieve. Provincial Standards are useful, therefore, for assessing Grade 9 students in all types of school programs — public, private, and home education.

## ***Purpose of Assessment Standards***

The following statements describe what is expected of Grade 9 students who are meeting the *acceptable standard* or the *standard of excellence* on independent work at the end of the Grade 9 Science program. The statements represent the standards against which student achievement will be measured. By comparing actual results to provincial standards, decisions can be made about whether achievement is in fact "good enough."

## ***Acceptable Standard***

For students to meet the *acceptable standard* of performance in Grade 9 Science, they are expected to have a basic understanding of the conceptual and procedural knowledge that is essential to the Junior High science program. For example, they can easily apply concepts and basic procedures in simple and familiar situations in which they have had previous experience, but they are challenged when applying these concepts and procedures to unfamiliar or complex situations. Students may be able to identify the name of an organism in a classification system, for example, but have difficulty



interpreting the relationship of organisms at the same classification level.

To meet the *acceptable standard*, students are expected to know how to apply higher level thinking skills in familiar situations. However, students may have difficulty applying these skills in new or unfamiliar situations. For example, they can predict the effects of linking a familiar and identical electrical load in series or parallel circuit, but may have difficulty predicting the effects of linking different or unfamiliar types of electrical loads in these circuits. They can use basic skills to show what they know and can do in novel real-life problems that are simple or that require single-step solutions. Also, they can apply more advanced skills or follow multi-step procedures to solve familiar real-life problems in which they have had prior experience. For example, in a problem-solving activity to find the best insulating material, these students will be able to develop a simple and controlled procedure, collect a set of data, and determine the best insulator. However, their procedures will likely not have more than one manipulated variable and may lack a complete and logical explanation of results.

Students who meet the *acceptable* level of performance generally have a positive attitude toward learning about the world in which they live. They appreciate how science and technology affect them on a day-to-day basis. They are skilled in using the basic procedures of science inquiry, technological problem solving, and societal decision making; however, they have difficulty with the application of more advanced skills and have limited ability to make connections between science, technology, and society.

### ***Standard of Excellence***

Most students who meet the *standard of excellence* in Grade 9 Science have an

exceptional understanding of the conceptual and procedural knowledge outlined in the *Program of Studies*. They can quickly and confidently apply this knowledge in complex and novel situations. For example, not only can they identify the abiotic factors that affect the health and distribution of living things, they also can predict the possible outcomes of changing abiotic factors on living things and evaluate their effects on the quality of the environment.

These students are expected to be able to apply higher-level thinking skills to unfamiliar situations. In addition, they can easily and quickly solve problems they have direct experience with and that require single-step or multi-step solutions. These students can solve a problem in more than one way and can see more than one solution for some problems. For example, not only are they familiar with the basic operation of an electric motor, but they can troubleshoot an inoperative motor, make design changes to meet varying performance criteria, and construct a working motor. Their problem-solving approach may involve more than one manipulated variable and include logical explanations of procedures and results.

Students meeting the *standard of excellence* have a positive attitude about science and its role in their world. They are curious, open-minded, creative, and confident. In addition, they are persistent problem solvers and have the ability to view a situation from a number of perspectives. Not only do they have a high level of awareness and understanding of how science and technology affect them personally, they can translate this understanding and awareness to societal issues. They are skilled in using the basic procedures of science inquiry, technological problem solving, and societal decision making. They can successfully use advanced skills and make connections between science, technology, and society.



# Grade 9 Science Assessment

## General Description

The Grade 9 Science assessment instrument (machine scored) consists of two parts:

Part A has 50 multiple-choice questions\* each with a value of one mark.

Part B has 5 numerical-response questions\* each with a value of one mark.

Students are to record their answers on a separate answer sheet.

The assessment is designed to be completed in 75 minutes. However, additional time of up to 30 minutes may be provided to allow students to finish. We suggest that those students who finish writing before one hour has elapsed remain at their desks to review their answers.

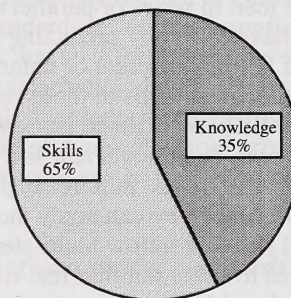
Students will need HB pencils, erasers, and scrap paper.

## Content

This assessment is based on science learnings within which the nature of science, of science and technology, and of science, technology, and society are integrated components.

The learning components, knowledge and skills, are integrated in the assessment. Knowledge is the fundamental understanding of concepts and processes of science. Skills refer to the application of knowledge.

The weighting for each component is shown in the following circle graph:



The skills component consists of:

- inquiry skills
- technological problem-solving skills
- societal decision-making skills

The context of the assessment includes questions from:

Diversity of Living Things  
Fluids and Pressure  
Heat Energy: Transfer and Conservation  
Electromagnetic Systems  
Chemical Properties and Changes  
Environmental Quality

*\*All grade 9 Achievement Tests will consist of 55 questions*



## Blueprint

The emphasis for each topic and learning domain are presented in the blueprint.

### Blueprint Grade 9 Science Assessment

| Topic                                  | Number of Questions (Percent) | Learning Components Emphasis<br>Number of Questions and (Percent) |         |
|--|-------------------------------|---|---------|
|  |                               | Knowledge   | Skills  |
| Diversity of Living Things             | 10 (18)                       | 4 (7)   | 6 (11)  |
| Fluids and Pressure                    | 10 (19)                       | 3 (6)   | 7 (13)  |
| Heat Energy: Transfer and Conservation | 7 (13)                        | 3 (6)   | 4 ( 7)  |
| Electromagnetic Systems                | 9 (16)                        | 3 (5)   | 6 (11)  |
| Chemical Properties and Changes        | 9 (17)                        | 3 (6)   | 6 (11)  |
| Environmental Quality                  | 10 (17)                       | 3 (5)   | 7 (12)  |
| Total                                  | 55 (100)                      | 19 (35)   | 36 (65) |

Note: The number of questions on the test may vary slightly from those indicated in the learning domain.

### Confirming Standards

Confirming standards is a process whereby judgements about students' performance on the assessment are made in relation to provincial standards. For more information on confirming standards procedures, refer to Appendix A of the *Achievement Testing Program Provincial Report, June 1993 Administration*. For information on the selection of teachers for participation in the confirming standards process, refer to the *Achievement Testing Program General Information Bulletin*.

### Preparing Students for the Assessment

*I strongly advocate preparing children to understand tests and testing through extensive class discussion about the makeup of the test and how to take it, and then adequate practice to find out their own particular weaknesses in approaching tests.*

—Graves, p. 183

We hope that teachers share the following information with their students to help them prepare for the science assessment.

- Talk with your students about some of the positive and negative aspects of taking tests. Share some of your own experiences and have your students share theirs.



- Familiarize your students with the format of the achievement assessment and the kinds of questions that will appear on it by having them work through the sample questions.

### ***Suggestions for Answering Multiple-Choice Questions***

- The questions in the achievement assessment are integrated in narrative themes.
- Frequently, a number of questions are clustered around a common context.
- Students should use other information given for answering questions by:
  - a. reading the information and thinking carefully about it before trying to answer any of the questions that need the information; or
  - b. reading the questions first and then reading the information, keeping in mind the questions they need to answer.
- When information is given for more than one question, students should go back to the information before answering each question.
- Students must make sure they look at all forms of information given. Information may be given in words, charts, pictures, graphs, and maps.
- Students should choose the answer they think is best. If they don't see a correct or best answer right away, they are encouraged to find the two choices that seem closest to the correct answer and pick one of them for the answer.

### ***Suggestions for Answering Numerical-Response Questions***

- Make sure you look at all the information given.
- Calculate your answer and check your work before entering the answer on the answer sheet.

## ***Sample Questions***

The following sample questions reflect the nature and complexity of the questions that will appear on the Grade 9 Science Assessment.

We encourage teachers to familiarize students with the assessment by having them work through these sample questions. A practice answer sheet for the numerical-response questions is provided on page 21 so that students can familiarize themselves with this new form. Please note that this collection of sample questions has been used on previous achievement tests and may be used with students. Other items from previous tests remain secured (see *General Information Bulletin*). These questions reflect the nature and complexity of items that will appear on the Science Assessment. The questions do not necessarily represent the assessment emphasis as presented in the blueprint.

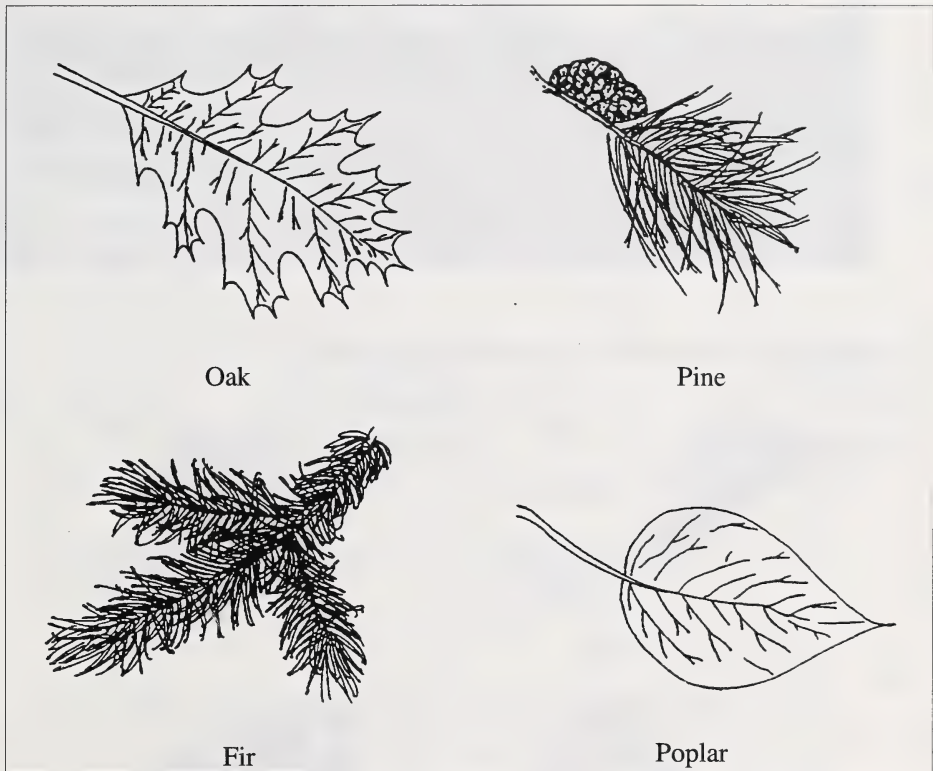
Questions 1 to 25 are multiple-choice questions. Questions 26 to 28 are numerical-response questions. A table of the key and descriptors for the sample questions is found on pages 25 to 26.



1. Kayla found a number of different organisms that have similar names. Which pair of organisms are **most** closely related?

- A. *Sciurus carolinensis*, *Sciurus niger*
- B. *Rattus tamias*, *Tamias striatus*
- C. *Mus musculus*, *Tamias striatus*
- D. *Sciurus niger*, *Mus niger*

Use the following information to answer question 2.



2. Kayla is selecting trees to plant in a bird sanctuary. Which leaves are **best** suited for minimum evaporation and moisture loss?
- A. Oak and poplar
  - B. Poplar and fir
  - C. Pine and oak
  - D. Fir and pine



Use the following information to answer question 3.

Kayla made a new bird feeder. She filled it with seeds and put it on some grass close to a lake.

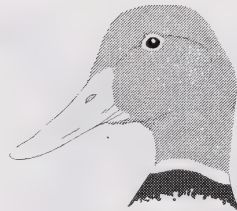


3. Which bird is **best** adapted to feed at this bird feeder?

A.



B.



C.



D.



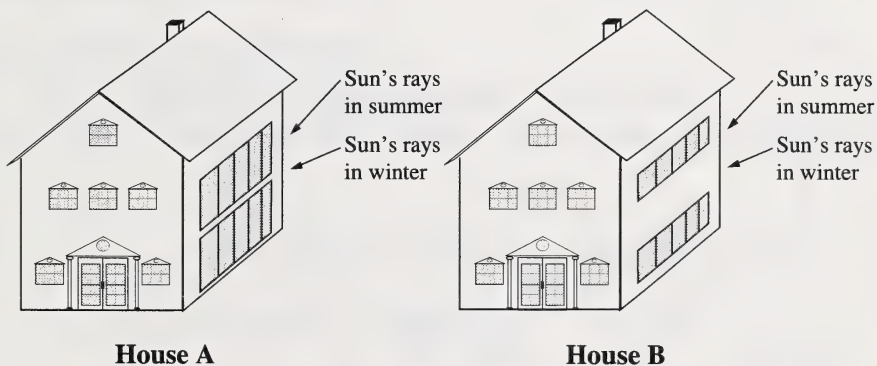
Use the following information to answer question 4.

When Kayla walked across a frozen lake one winter, the ice began to crack. She immediately lay flat on the ice and then slowly crawled out of danger.

4. Kayla lay flat on the ice because she wanted to
- A. minimize her fall through the ice
  - B. distribute her weight closer to the ice
  - C. distribute her weight over an increased area
  - D. minimize her force by lowering her weight closer to the ice

Use the following information to answer question 5.

The arrows show the angle of the sun's rays at noon during summer and winter.



Both houses are constructed of the same material and in the same way.

5. The Brown family is concerned about heat loss and cooling. They looked at the two houses shown in this diagram. Which of the following statements is correct?
- A. House "A" would be cooler in summer.
  - B. House "B" would be cooler in summer.
  - C. Both houses would be equally cool in summer because both have the same roof slope.
  - D. Both houses would overheat in summer because both have large, south-facing windows.



Use the following information to answer question 6.

Mai Lee wanted to determine the reaction time for zinc and dilute hydrochloric acid. Into each of four test tubes, she placed 15 mL of water and a 3 cm piece of zinc ribbon. Then she added the following amounts of acid:

Test tube W — 2 drops

Test tube X — 4 drops

Test tube Y — 8 drops

Test tube Z — 20 drops

Mai Lee started a stop watch when the acid was added and stopped the watch when the contents of each test tube stopped bubbling.

6. Which table would be the **best** to use to record the results of this experiment?

A.

| Drops of acid used | Length of zinc ribbon (cm) | Reaction time (s) |
|--------------------|----------------------------|-------------------|
| 2                  |                            |                   |
| 4                  |                            |                   |
| 8                  |                            |                   |
| 20                 |                            |                   |

B.

| Test tube | Drops of acid used | Reaction time (s) |
|-----------|--------------------|-------------------|
| W         |                    |                   |
| X         |                    |                   |
| Y         |                    |                   |
| Z         |                    |                   |

C.

| Test tube | Water used (mL) | Length of zinc ribbon (cm) | Drops of acid used |
|-----------|-----------------|----------------------------|--------------------|
| W         |                 |                            |                    |
| X         |                 |                            |                    |
| Y         |                 |                            |                    |
| Z         |                 |                            |                    |

D.

| Test tube | Water used (mL) | Length of zinc ribbon (cm) | Reaction time (s) |
|-----------|-----------------|----------------------------|-------------------|
| W         |                 |                            |                   |
| X         |                 |                            |                   |
| Y         |                 |                            |                   |
| Z         |                 |                            |                   |

Use the following information to answer question 7.

During a visit to a school, Mai Lee demonstrated a common test involving four household substances. Using red litmus paper and blue litmus paper, she showed students how to determine which substances are acids and which are bases. She made a solution of each substance and then tested it with the litmus paper.

**Results of Acid/Base Test**

| Solution               | Red litmus | Blue litmus |
|------------------------|------------|-------------|
| Orange juice           | Red        | Red         |
| Baking soda            | Blue       | Blue        |
| Drain cleaner          | Blue       | Blue        |
| Italian salad dressing | Red        | Red         |

7. The substances that contain acid are
- A. orange juice and baking soda
  - B. baking soda and drain cleaner
  - C. baking soda and Italian salad dressing
  - D. orange juice and Italian salad dressing

Use the following information to answer question 8.

An advertisement on the radio stated:

“Relief is just a spoonful away with Tummy-Aid! Tummy-Aid relieves acid indigestion faster than any other stomach remedy. Tummy-Aid’s secret ingredient gobbles up excess stomach acid and has you feeling better in a minute. On the job or on the go, you can trust your tummy to Tummy-Aid!”

8. The “secret ingredient” in Tummy-Aid acts like
- A. water
  - B. a base
  - C. an acid
  - D. an enzyme



Use the following information to answer questions 9 and 10.

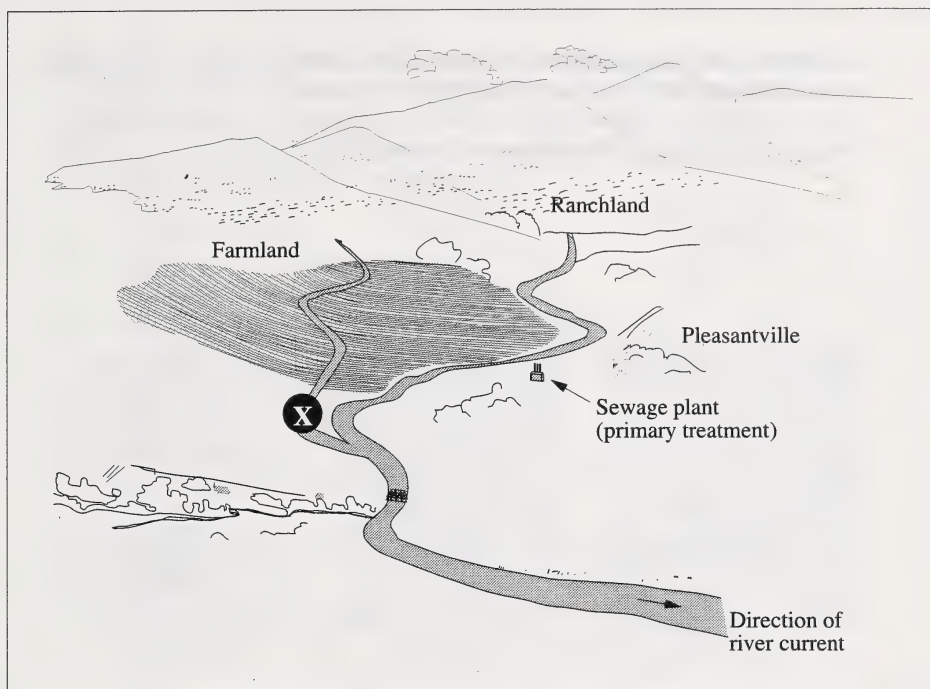
Some students studied the population of a specific organism found in a section of a river on the outskirts of Edmonton.

**Data Taken from Four River Water Samples**

| <b>Sample number (location)</b> | <b>Volume of sample (L)</b> | <b>Amount analysed (drops)</b> | <b>Average population of a specific organism (per drop)</b> | <b>Temperature of water sample (°C)</b> |
|---------------------------------|-----------------------------|--------------------------------|---|---|
| I                               | 3                           | 5                              | 18  | 12                                      |
| II                              | 3                           | 10                             | 4   | 10                                      |
| III                             | 3                           | 10                             | 7   | 11                                      |
| IV                              | 4                           | 10                             | 23  | 14                                      |

9. The only feature of this experiment that follows scientific principles is that the
- A. responding or dependent variables remained constant
  - B. manipulated or independent variables remained constant
  - C. average population of a specific organism per drop of sample was studied
  - D. sample volume taken from each location along the river was the same
10. The average population of the specific organism in this section of the river is
- A. not related to the amount of water analyzed
  - B. reduced with increased temperatures
  - C. greater with a larger number of drops analyzed
  - D. greater with a smaller number of drops analyzed

Use the following information to answer question 11.



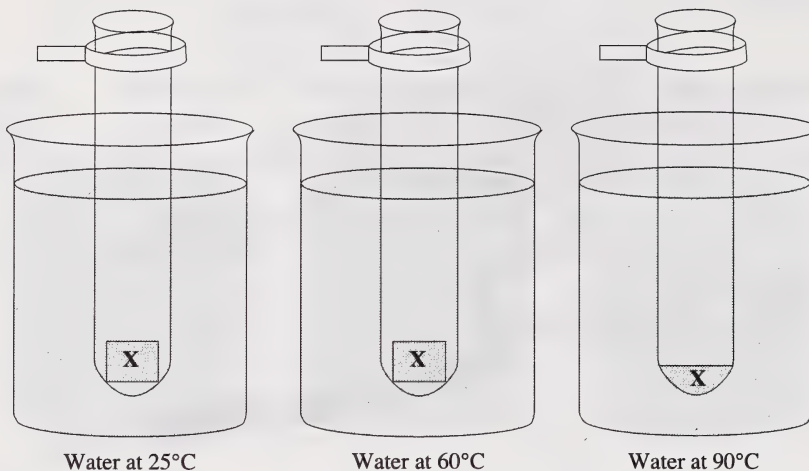
11. A water sample taken at X shows high levels of phosphate and nitrate. The **most likely** reason is that
- A. phosphate and nitrate build up whenever large numbers of farm animals are raised together
  - B. soil around this branch of the river is naturally high in these compounds
  - C. the farmers who till the farmland use excess commercial fertilizer
  - D. the farmers use large quantities of detergents when cleaning farm equipment
- 
12. A farmer planted a new high-yield hybrid corn. The original parent plants were resistant to a particular mould. However, the new corn plants contracted this mould, which nearly destroyed all the new plants. This is one of the problems that may occur with
- A. selective breeding
  - B. natural selection
  - C. adaptation
  - D. variation



Use the following information to answer question 13.

George plans to use a paste wax to protect the paint on his car. He designs an experiment to test for the melting point of the wax.

X represents a sample of the same wax in each test tube.



13. The melting point of the wax is

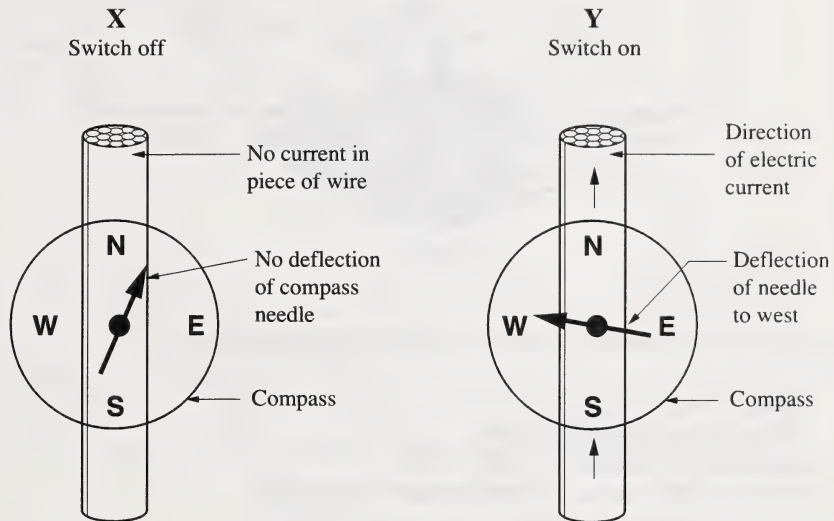
- A. lower than 25°C
- B. between 25°C and 60°C
- C. between 60°C and 90°C
- D. higher than 90°C

14. The Browns purchased a home and now want to install a solar collector to heat the swimming pool. The energy conversion that takes place when the sun warms the solar collector is

- A. thermal to solar
- B. solar to thermal
- C. solar to chemical
- D. physical to solar

Use the following information to answer question 15.

To test if a wire is carrying an electric current, Sandy places a plastic compass on top of the wire. With the switch off, the compass needle is in the position shown in diagram X. When Sandy turns the switch on, the wire carries an electric current and the needle suddenly moves to one side. This observation is shown in diagram Y.

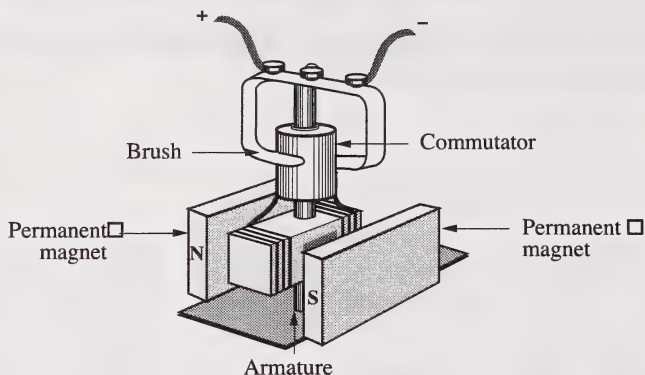


15. If the electric current travels in the opposite direction to that shown in diagram Y, the compass needle will point
- A. east
  - B. west
  - C. north
  - D. south



Use the following information to answer question 16.

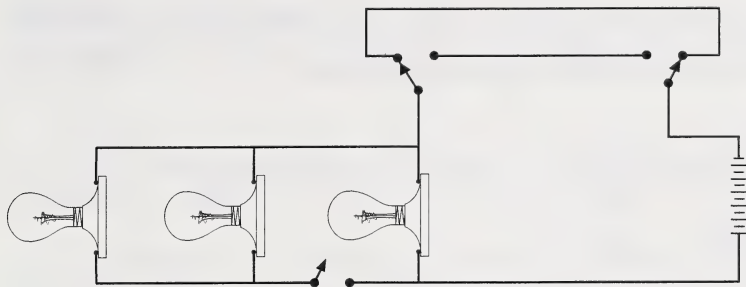
Two toy locomotives are driven by an electric motor.



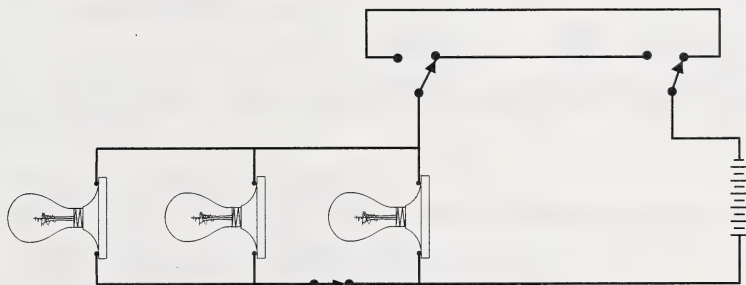
16. Which action would **not** increase the speed of the electric motor?
- A. Using stronger magnets
  - B. Using a greater electric current
  - C. Increasing the number of coils of wire
  - D. Reversing the direction of the permanent magnets
- 
17. George was concerned that the world's natural resources are gradually being depleted and environmental quality has deteriorated. George knew the **best** alternative energy source for his car would be
- A. solar energy
  - B. chemical energy
  - C. mechanical energy
  - D. electrical energy
18. George uses glue to repair the plastic on the car's tape player. As he prepares the glue by mixing two liquids, he notices an increase in temperature. This increase in temperature is **most likely** caused by the
- A. friction of mixing liquids
  - B. liquids absorbing heat from the room
  - C. heat flowing from the plastic door into the liquids
  - D. heat released from a chemical reaction between the liquids

19. Peter designs a new circuit for a light system in a model train station. Which diagram shows a circuit in which all three bulbs will light?

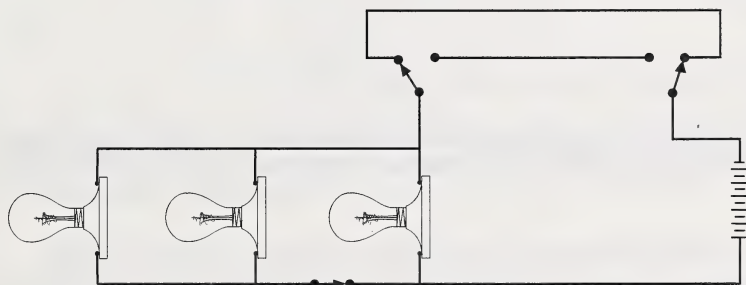
A.



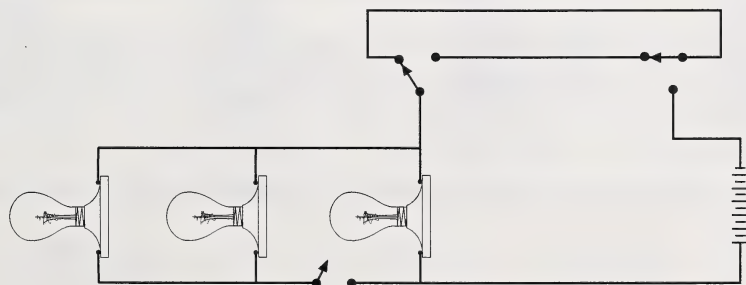
B.



C.



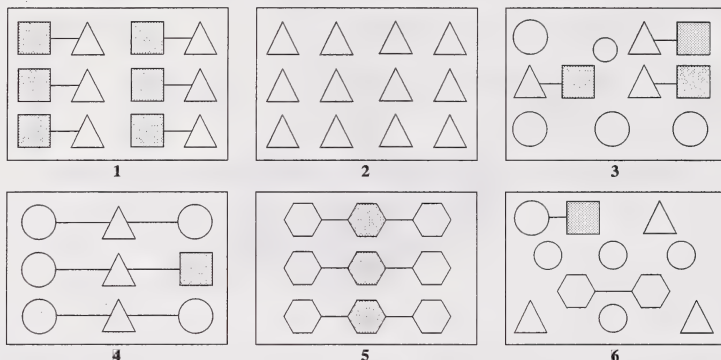
D.





Use the following information to answer question 20.

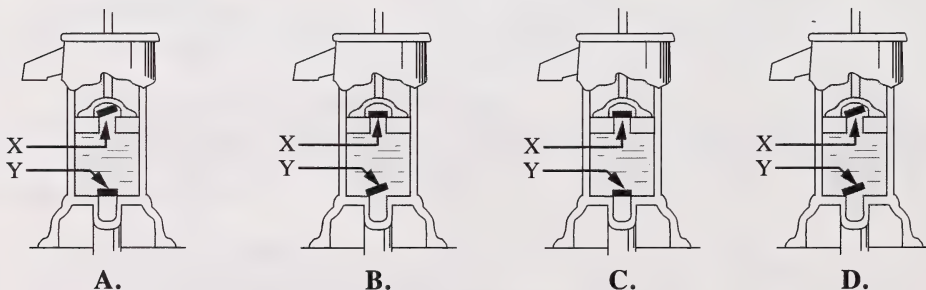
Mai Lee knows that models are useful tools for describing and identifying compounds. In the models shown, the individual shapes represent atoms. The shapes joined by lines represent molecules.



20. Pure compounds are represented by models

- A. 1 and 4
- B. 1 and 5
- C. 2 and 4
- D. 2 and 5

21. After making some drawings, Rhonda is able to find out how a hand pump works. Which cross-section of a pump shows the correct position of the valves **X** and **Y** when the piston is moving up?



22. In which sport is the resistance of fluid to forward movement the **most** significant problem?
- A. Running
  - B. Sailing
  - C. Swimming
  - D. Bicycling

*Use the following information to answer question 23.*

While camping, Jill uses hot rocks to heat water for washing dishes. She takes two heated rocks from the fire and places one in one container and the other in an identical container. Each container holds 4 L of water at the same initial temperature.

23. The final temperature of the water in each container will always be the same if the two rocks have equal
- A. mass and are the same substance
  - B. mass and are a different substance
  - C. volume and are a different substance
  - D. volume and a different initial temperature

*Use the following information to answer question 24.*

While reviewing some reference material, Jane read the following descriptions of two animals:

The sea anemone looks like a brilliantly coloured underwater flower. But the “petals” are really poisonous tentacles designed to capture passing fish. Once the fish is stunned or killed, it is pulled into the sea anemone’s mouth and quickly digested.

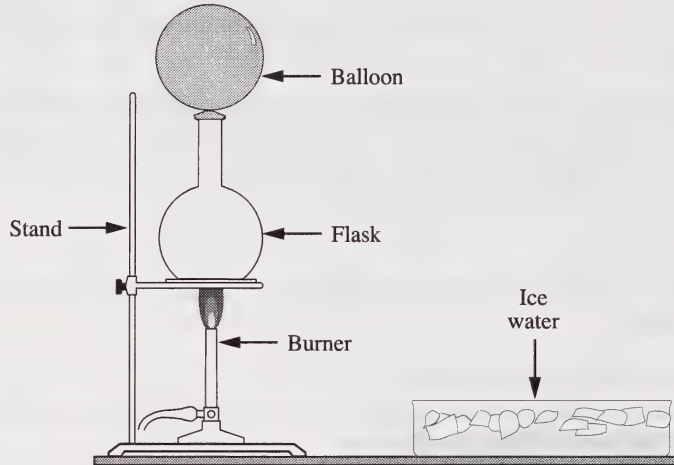
Jellyfish move in the ocean by using muscle tissue. They have an umbrella-shaped, jelly-like body and long tentacles. These tentacles protect the jellyfish and enable it to capture other organisms for food.

24. The similarity that **best** illustrates relatedness of the two animals is that they both
- A. have tentacles
  - B. live in the sea
  - C. have muscle tissue
  - D. use tentacles to catch their prey



Use the following information to answer question 25.

Sid and Tanya want to determine the effects of heat on air before they go for a hot air balloon ride. They design a model of a hot air balloon using a balloon attached to the mouth of a flask. They heat the flask for one minute and then place it in a pan of ice water.



25. When the flask is placed in the pan of ice water, the balloon will
- A. inflate
  - B. deflate
  - C. remain the same
  - D. be pulled into the flask

Sample Instruction Page for Numerical-Response Questions

Instructions:

- In this part of the assessment, there are three numerical-response questions, each with a value of one mark.
- Read each question carefully.
- Write your answer in the boxes on the answer sheet, beginning in the left-hand box. Then, carefully fill in the circles that match your answer.
- Ignore the decimal point unless the question indicates otherwise.
- Use only an HB pencil. If you wish to change an answer, **erase** your first answer **completely**.

Example

1. Red litmus paper was used to indicate whether four solutions found in a kitchen were acidic or basic. The results are shown in the table below.

| Solution | Colour of Litmus Paper |
|----------|------------------------|
| 1        | pink                   |
| 2        | no change              |
| 3        | red                    |
| 4        | blue                   |

|   |   |   |   |
|---|---|---|---|
| 3 | 1 | 2 | 4 |
|---|---|---|---|

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2 2 2 2

3 3 3 3

4 4 4 4

5 5 5 5

6 6 6 6

7 7 7 7

8 8 8 8

9 9 9 9

Record the order of the solutions from **most** acidic to **most** basic.

Answer: 3 1 2 4

Practice Answer Form for Numerical-Response Questions

1

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26. An engineer designed an electric circuit to test the heating effect of different thicknesses of the same type of wire.

These variables were kept the same:

- strength of the current
- length of the wire
- period of time

The table shows the results.

**Results of Wire Thickness Test**

| Wire number | Diameter (mm) | Temperature (°C) |
|-------------|---------------|------------------|
| 1           | 0.1           | 80               |
| 2           | 0.4           | 50               |
| 3           | 0.3           | 60               |
| 4           | 0.2           | 70               |

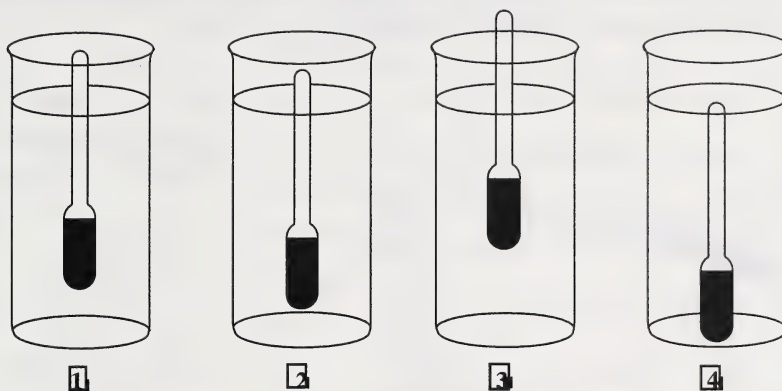
Ordered from **lowest** to **highest** resistance, the wires are

\_\_\_\_\_

CTION OF THE ANSWER SHEET

Use the following information to answer question 27.

A candy maker tested four different sugar solutions by placing a hydrometer in each.



27. The four solutions arranged in order from **lowest** density to **highest** density are

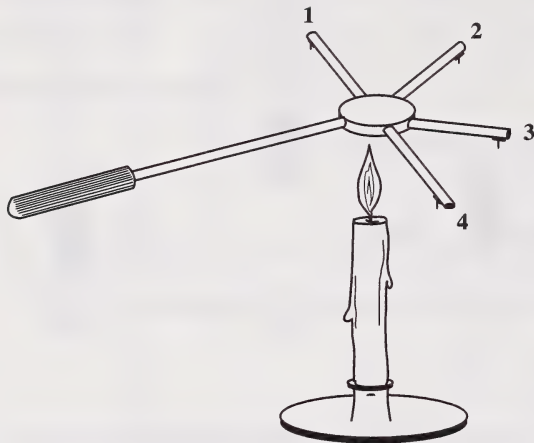
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SECTION OF THE ANSWER SHEET



Use the following information to answer question 28.

A kitchen appliance designer needed to know how well different metals transfer heat. Tacks were attached with wax to four rods of the same length and thickness. The rods were heated for eight minutes and the time it took for the tacks to fall off was recorded in the table.



| Rod | Time (seconds)   |
|-----|------------------|
| 1   | 360              |
| 2   | 45               |
| 3   | Did not fall off |
| 4   | 80               |

28. The rods ranked from the one having the **poorest** heat transfer to the one having the **best** heat transfer are

\_\_\_\_\_

SECTION OF THE ANSWER SHEET

### Key and Descriptors for Sample Questions

| Ques. | Key | Topic                                  | Learning Domain | Curriculum Standard  | Assessment Standard* |
|-------|-----|--|-----------------|--|----------------------|
| 1     | A   | Diversity of Living Things             | Skill           | Infer the relatedness of species on the basis of their classification                            | E                    |
| 2     | D   | Diversity of Living Things             | Knowledge       | Recognize plant adaptations for reducing water loss  | A                    |
| 3     | A   | Diversity of Living Things             | Skill           | Infer the adaptation of birds for securing food  | A                    |
| 4     | C   | Fluids and Pressure                    | Knowledge       | Know that pressure decreases as surface area increases   | A                    |
| 5     | B   | Heat Energy: Transfer and Conservation | Knowledge       | Know the effect of structural designs on the amount of cooling in houses                         | A                    |
| 6     | B   | Chemical Properties and Changes        | Skill           | Organize data that will show the effect of acid on a material                                    | E                    |
| 7     | D   | Chemical Properties and Changes        | Skill           | Identify the presence of acids and bases in household products                                   | A                    |
| 8     | B   | Chemical Properties and Changes        | Knowledge       | Recognize the effects of acid/base reactions   | A                    |
| 9     | C   | Environmental Quality                  | Skill           | Interpret data from a chart  | E                    |
| 10    | A   | Environmental Quality                  | Skill           | Interpret data by relating the average population of an organism to the amount of water analyzed | E                    |
| 11    | C   | Environmental Quality                  | Skill           | Infer the cause of increased chemical levels in a river  | A                    |
| 12    | A   | Diversity of Living Things             | Knowledge       | Identify problems of selective breeding  | A                    |
| 13    | C   | Chemical Properties and Changes        | Skill           | Interpret information to determine the melting point of a solid                                  | A                    |
| 14    | B   | Heat Energy: Transfer and Conservation | Knowledge       | Know how a solar collector converts the Sun's energy into heat                                   | A                    |
| 15    | A   | Electromagnetic Systems                | Knowledge       | Know that electromagnetic effects are caused by a current flowing through a wire                 | A                    |
| 16    | D   | Electromagnetic Systems                | Knowledge       | Know the operation of an electric motor  | A                    |
| 17    | A   | Environmental Quality                  | Knowledge       | Identify personal actions that can result in preserving the environment                          | A                    |
| 18    | D   | Chemical Properties and Changes        | Knowledge       | Recognize that chemical change in materials can produce heat                                     | A                    |
| 19    | C   | Electromagnetic Systems                | Skill           | Apply knowledge of working switches in a circuit   | A                    |
| 20    | B   | Chemical Properties and Changes        | Knowledge       | Select the appropriate model to explain a specific chemical composition of compounds             | E                    |



|    |        |  |           |  |   |
|----|--------|--|-----------|--|---|
| 21 | B      | Fluids and Pressure                    | Knowledge | Know the operation of various kinds of valves  | A |
| 22 | C      | Fluids and Pressure                    | Knowledge | Know the effect of resistance on objects moving in fluids  | A |
| 23 | A      | Heat Energy: Transfer and Conservation | Skill     | Predict final temperatures of a solution based on the principle of specific heat capacities and mass | A |
| 24 | D      | Diversity of Living Things             | Knowledge | Identify specialization within related groups of organisms   | A |
| 25 | B or D | Fluids and Pressure                    | Knowledge | Recognize the compressibility of liquids and gasses in terms of the particle theory                  | A |
| 26 | 2341   | Electromagnetic Systems                | Knowledge | Know the effect of resistance on electron flow   | E |
| 27 | 4213   | Fluids and Pressure                    | Skill     | Infer fluid density from the changes in buoyant force  | A |
| 28 | 3142   | Heat Energy: Transfer and Conservation | Skill     | Interpret data and compare heat conduction rate of materials   | E |

\*A—Students meeting the acceptable standard should be able to correctly answer questions such as these.

E—In addition to answering the questions identified for the acceptable standard, students meeting the standard of excellence should be able to correctly answer questions such as these.

## Credit

Donald H. Graves, *Build a Literate Classroom* (Toronto: Irwin Publishing, 1991), p. 183

## Alberta Education Contact

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